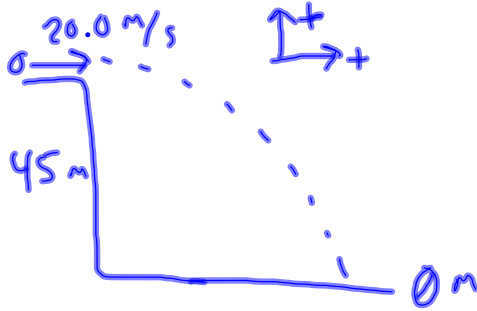


# Projectile Motion Practice Problems AP Physics 8.31.11

A stone is thrown from the top of a building horizontally with an initial speed of 20.0 m/s. The height of the building is 45.0 m.

- How long does it take the stone to reach the ground?
- What is the speed of the stone just before it strikes the ground?



$$V_{iy} = 0 \text{ m/s}$$

$$a_g = -9.8 \text{ m/s}^2$$

$$\Delta y = -45 \text{ m}$$

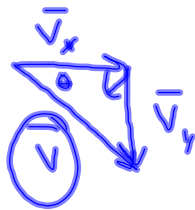
$$t = ?$$

$$\Delta y = V_{iy}t + \frac{1}{2}a_g t^2$$

$$t = \sqrt{\frac{2\Delta y}{a_g}}$$

$$= 3.03 \text{ s}$$

b)



final velocities

$$V_{fx} = 20 \text{ m/s}$$

$$V_{fy} = -29.7 \text{ m/s}$$

$$V_{fx} = V_{ix} + a_x t$$

$$V_f = 35.8 \text{ m/s}$$

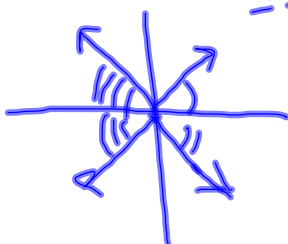
$$V_{fx} = V_{ix}$$

$$\theta = 56^\circ \text{ S of E}$$

$$V_{fy}^2 = V_{iy}^2 + 2a_g \Delta y$$

$$V_{fy} = \pm \sqrt{2a_g \Delta y}$$

$$= -29.7 \text{ m/s}$$



## Projectile Motion Practice Problems AP Physics 8.31.11

Tennis Ball Throwing Lab AP Physics.pdf - Adobe Reader

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1 / 1 78.4% Find

Height. Create a table for your data

2. Launch the tennis ball supplied to your group by throwing it, attempting to achieve maximum range. Be sure to write down any data collected in the data table.

3. Repeat the lab for each group member.

**Total Points: 27**

**Data Table: 4 points**

**Points:**

**ANALYSIS:**

In addition to any necessary measurements or calculations from the experiment itself, include the following in your lab report.

4. Calculate the horizontal velocity, vertical velocity, angle of the throw, and initial velocity for your personal throw. Show all necessary calculations.
5. Plot the horizontal velocity vs. time. Explain the implications of your graph.
6. Plot the vertical velocity vs. time. Explain the implications of your graph.
7. Derive an expression for the range of the projectile in terms of  $t$ ,  $v$ ,  $\sin \theta$ ,  $\cos \theta$ , and  $g$ .
8. Determine which angle would produce the greatest range, ignore air resistance. Show any calculations or derivations you used.
9. Determine the maximum range for the velocity of your throw based on the angle calculated in the previous question and explain why your projectile did not achieve maximum range.

4  
4  
4  
3  
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4

## Projectile Motion Practice Problems AP Physics 8.31.11

A stone is thrown from the top of a building upward at an angle of  $30.0^\circ$  to the horizontal with an initial speed of  $20.0 \text{ m/s}$ . The height of the building is  $45.0 \text{ m}$ .

- a) How long does it take the stone to reach the ground?
- b) What is the speed of the stone just before it strikes the ground?